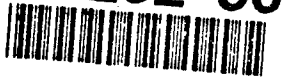

Night Vision Technology and the Night Attack by Light Infantry

A Monograph
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ABSTRACT

NIGHT VISION TECHNOLOGY AND THE NIGHT ATTACK BY LIGHT INFANTRY by MAJ James W. McNulty, USA, 67 pages.

This monograph discusses the role that night vision technology plays in the planning and execution of the night attack by light infantry units at battalion level and below. The tactical framework for the night attack and the night vision equipment that support it are examined from the perspective of the individual soldier, small units, and the enemy. The purpose is to determine the role that night vision equipment plays in the night attack. Three models are used to describe and analyze the relationships between the soldier, the small units, and the night vision devices that they employ. These models highlight the specific capabilities and limitations that are experienced by light infantry forces as they attack at night.

Two historical examples are used to illustrate the application of night vision technology in the night attack--the attack by 42 Commando at Mount Harriet, Falkland Islands, 1982, and an attack by a light infantry battalion conducted at the National Training Center in 1992. Both examples highlight the unique aspects of the night attack in the era of night vision technology.

As a result of the consideration of the tactics, technology, and the historical examples a conclusion is reached. It is, that although the tactical system is sound, the over emphasis and over reliance on night vision technology without a firm understanding of its specific capabilities and limitations constitutes the unconsidered application of a technological innovation. Recommendations are made to correct this trend.

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I. Introduction

> Limited visibility is the basis for infantry battalion operations. It is the environmental condition that the US military seeks to take advantage of its technology and training. Darkness, fog, heavy rain, and falling snow all limit visibility. A combination of technical ability (afforded by [night vision devices]) and tactical prowess (afforded by training) allows the infantry battalion to operate routinely during these conditions.[1]

The night attack is one of the most demanding missions that an infantry unit has to be able to accomplish. It takes the problems associated with a daylight attack and magnifies them by denying us our principal sensory tool--vision. During the last twenty years the efforts of the research, development and acquisition community have made great strides in improving the situation of the infantry as it attacks at night by providing an assortment of high technology night vision devices to the field. The widespread distribution of these devices during the last decade has given the infantryman an unprecedented ability to overcome the constraints imposed by darkness. This has prompted a shift in the doctrinal thought regarding the infantry and its' role on the battlefield. The quotation cited above from the 1992 edition of Field Manual 7-20, The Infantry Battalion, drives this point home by stressing that light infantry units can use their technologically assisted ability to see at night coupled with their tactical acumen to fight at night as if it were a routine event.

The doctrinal shift that has occurred is a subtle, but significant one. Historically, doctrine has treated the night attack as rarely necessary, but nevertheless useful adjunct to daylight operations. It promised realistic gains with minimal losses in difficult situations. These advantages were counterbalanced by the risks associated with fighting in an environment where one was blind. The potential for getting lost, engaging a friendly force by mistake, or losing the element of surprise during the attack were all very real and possibly lethal outcomes of a night attack. The current doctrinal thrust is to treat the darkness as the nearly exclusive medium in which we conduct combat operations. What was the exception has become the rule. This shift is predicated on the ability of a technological innovation to turn darkness into a normal operating environment.

Technological innovation has often been the mother of doctrinal and tactical change. Sometimes these changes were warranted, resulting in spectacular successes, and sometimes they were unwarranted, resulting in dismal failures. The problem is determining in advance which changes make sense in light of what the technological innovation offers; and proving that the changes will work within the context of the doctrinal and tactical systems in which they reside. This larger body of tactical and doctrinal precepts includes our own systems, those of our allies, and most importantly those of our enemies. Our technological innovations and their integration into our doctrine and tactics must accurately account for and predict the capabilities and

limitations of both the new technology and the reaction of a hostile thinking enemy. If it fails to do so, the force that bases their doctrinal and tactical system on a technological innovation is subject to potentially catastrophic failure.

Have we made an accurate and realistic account of our use of technology, and have we effectively appraised our enemy's reaction to our use of technology?

This question arose from three observations. First, the tactical method that light infantry forces employ during the conduct of the night attack has made a fairly significant change during the last ten years. We have moved from a tactical system that directed a linear attack, with squads on line; to a system where squad, platoon and sometimes company size elements attack through an intricate combination of maneuver and fire to reduce an enemy position. The former system, a battle tested one, used an extremely simple tactic to ensure that the direction and control of units and fires was maintained.[2] The current system, untested in combat, relies on the technological capabilities of night vision equipment (NVE) to allow us to operate at night in much the same manner that we would in daylight.[3]

The second observation stems from the application of the current night attack doctrine at our combat training centers. After participating in, observing, and studying the experiences of light infantry units who have applied the doctrine against an aggressive opponent two points surfaced. The NVE that we

rely on is very good, but it does not turn night into day. It has very specific capabilities and limitations that must be addressed in order to make the most effective use of it. Additionally the tactical system that is employed during the night attack has an inherent need for flexibility because every attack is different. The terrain, weather, enemy situation and one's own situation combine in an infinite number of permutations and combinations that will dictate how to best attack at night. Neither the older linear attack nor the attack by maneuver and fire are always the right way to approach the problem. Sometimes one form will work better than the other; sometimes a combination will work; and sometimes neither appears to be a feasible solution. The bottom line is that our training center experiences are proving that the doctrinal and tactical framework that we employ at night, and our integration of night vision technology (NVT) into the framework is ground that is ripe for experimentation and there is room for change.

The final observation that portends a need for a closer examination of the doctrine for the night attack is the general lack of combat experience and historical data on the offensive use of the technology by light infantry forces. Because the technology is new and has only recently been fielded in large quantities, there is little in the form of combat experience to validate the current doctrine for the night attack. From the perspective of the United States' forces, our operations in Grenada, Panama, Kuwait and Iraq did not conclusively prove that the night attack doctrine is valid. Although all these operations were

initiated at night and involved large numbers of light infantry forces they did not possess a significant element of actual night combat that falls under the doctrinal definition of the night attack. The operations that took place usually took the form of raids or meeting engagements rather than night attacks against a defending enemy.

In order to limit the scope of the question under consideration, three constraints have been applied to define the size of unit, mission, and conditions of the attack. Night attacks are fought by infantry squads and platoons. These units are in turn controlled by companies who are resourced and supported by battalions. Therefore the units under consideration will be those at the battalion level and below. The types of infantry units under consideration will only include those that are manned and equipped to fight on foot, i.e. light, airborne and air assault infantry.

The terminology 'night attack' excludes special purpose operations such as raids and ambushes, but includes infiltration as a supporting form of maneuver and a possible prelude to the night attack. The conditional quality, night, restricts the question by specifying only those battles that take place between the end and beginning of nautical twilight.[4] It does not include night approaches followed by daylight battles or daylight battles that were concluded at night. The intent of these constraints is to limit the problem area to the night attack by small unit light infantry forces as defined in the current doctrinal publications.[5]

The research involved in the examination of the infantry night attack and NVT revealed three threads of continuity that will appear throughout the analysis. The first of these is that the principles that apply to the modern night combat system are similar to those that evolved throughout the history of night attacks. New principles are not what is needed. What is needed are new ways of thinking about and applying these principles in the high technology environment. Next, our evaluation of night vision devices (NVD) consistently overestimates their capabilities and discounts their limitations. Finally, our process of integrating NVT with doctrine and tactics has done a poor job of addressing the point that every technological action that we take has a potential counteraction that the enemy can take. We fail to recognize that "the opponent thinks, reacts and spits venom," or at the very best we have done a cursory analysis of it.[6]

II. The Doctrine and Tactics for the Night Attack

The starting point for an examination of the role that NVT plays in the night attack is the doctrine that supports it and the tactics that guide it. The adage about the one-eyed man being king in the realm of the blind is a meaningful one as we begin the study of the modern night attack. The gist of the night tactical system is to use the advantages offered by NVE to stealthily close with an opponent and then to destroy or displace him once a superior

position is gained. In essence, we use our superiority in NVE to become the one-eyed king of the battlefield.

The broad doctrinal concepts that form the framework for the night attack are found in Field Manual 100-5, Operations (FM 100-5) and in Field Manual 7-20, The Infantry Battalion (FM 7-20). In the widest sense these publications state that we recognize that war takes place in a fast pace, high technology environment. The force that is the best equipped and best prepared to relentlessly press any advantage will be successful because their opponent will never have an opportunity to recover. The concept of continuous operations as a major contributor to the rapid resolution of the fight is the doctrinal starting point for offensive night operations.[7] It springs from the desire to continually press the attack, which logically follows from the nature of high technology warfare.

Once the linkage between the technological environment and continuous operations is established, the relationship is codified in the discussion of offensive operations. FM 100-5 recognizes that we will be able to conduct night operations more effectively than ever before by utilizing NVDs.[8] It then goes on to describe the reasons why we conduct night attacks, and in the process of doing so further links the night attack to technology. The first two reasons FM 100-5 gives for attacking at night are to maintain momentum and to exploit success.[9] Both are rooted in the higher doctrinal desire to conduct continuous operations. Achieving surprise, rupturing strong defenses, and

offsetting enemy air superiority are the final three reasons for the night attack.[10] The underlying premise here is to use the concealment that the night affords us to conduct what would be costly undertakings in daylight. This constitutes implicit recognition of concealment as the singular advantage that darkness confers upon an attacker, and it lends credence to the idea of exploiting the night time environment whenever possible. FM 7-20 and FM 100-5 take this point further by saying that we should seek to minimize the disadvantages inherent at night by using NVT coupled with highly trained units to conduct night operations.[11]

The underlying doctrinal concepts for the night attack that develop from this line of reasoning are that darkness is a powerful modifier of the environment of combat because of its ability to provide concealment. It provides us concealment from our enemies and also adversely affects us by denying us our principal sensory tool, vision. This disadvantage can be turned into an advantage through the use of NVE and the application of sound tactics by well trained units.

The tactical system that we use within this doctrinal framework is articulated in the field manuals that cover the employment of light infantry battalions, companies, and platoons and squads.[12] Together they provide a method for units to attack at night that seeks to translate inherent combat power into battlefield success within the doctrinal guidelines described above.

The method presented is one that places a premium on technology in order to allow infantry units to maneuver and apply their fires.

The night attack is by definition a deliberate attack which requires detailed reconnaissance and planning to compensate for the difficulties encountered in the areas of control, navigation, and fratricide.[13] The attack has two general forms, the limited visibility attack with NVDs, and the linear assault.

The limited visibility attack with NVDs (Figure 1) consists of a series of detailed movements that position forces in close proximity to their objective by relying on stealth and the exploitation of NVE. As a result of reconnaissance, a detailed plan is developed to move subordinate units into the objective area without being detected. This involves the identification of the objective's decisive point and the positioning of direct fire support, security, assault and breaching forces around it to facilitate its' attack. The unit begins the attack by crossing the line of departure and infiltrating to a clandestine operational rally point in the vicinity of the objective. From there, subordinate elements move further forward into support, security or assault positions and are prepared to launch their attack. The assault and breaching forces then begin their assault by attempting to silently breach or directly infiltrate the objective area.[14]

Direct fires and the final assault are initiated on order, or when the attack is discovered, with the goal being to avoid detection for as long as possible to achieve surprise. The actions within the objective area are

controlled by leaders at the squad and fire team level under the supervision of platoon leaders. This is in keeping with the tactical guideline of attacking the objective with the smallest possible force that can accomplish the mission. Subordinate unit objectives are assigned to the assault elements to control their fires, the direction of attack and their limit of advance. Additional units may follow the assault element onto the objective to continue the attack or to provide supporting fires.[15]

The limited visibility assault with NVDs is a demanding tactic. It requires that the unit avoid enemy contact until the unit is prepared to strike and at the same time to close with the enemy at very close ranges. Throughout this delicate process, control of unit movement and fires is maintained through the adherence to a detailed plan and the ability to see each other and the enemy as the attack takes place. Key prerequisites for this type of attack to succeed are a successful reconnaissance effort and continuous surveillance of the objective area. These provide the leaders the information they need to plan the attack and update that plan. Another requirement is an extraordinarily well trained unit, and soldiers who are capable of executing the plan of attack. This allows subordinate elements to act in a synchronized manner as they execute the mission. The final prerequisite is the proper mix and density of NVE, and the appropriate weather and ambient light conditions that allow them to work.

Every aspect of this type of attack relies on NVE as a facilitator of successful action. Units navigate, maintain contact between units and

individuals, control their fires, and detect the enemy through the use of NVT. Their compliance with the plan and the synchronization of their attack stems from their ability to overcome the limitations of darkness and at the same time utilizes darkness as a means of concealment. When the capability to overcome the constraints of the night are not available, the tactical procedure is changed to compensate for a new set of conditions. This procedure is the linear attack.

The linear assault is used by units that do not have sufficient NVDs to conduct attacks in twilight.[16] This tactic minimizes the role that NVE plays by establishing a rigid system of control measures to maintain coordination between the attacking units (see Figure 2). The force that attacks in this situation crosses the line of departure and moves in a column formation through a series of release points. At each release point, successively smaller units fan out until all squads are moving in column formation towards the probable line of deployment. The squads then deploy on line facing the objective and continue to advance until detected. Individuals then fire and maneuver across the objective on line until the opposing force is subdued.[17]

There are two variations of this tactic which require more reliance on NVDs. One is to establish a subordinate unit on the flank of the assaulting unit to provide supporting direct fires (Figure 3). Another is to designate a subordinate unit to follow the main attack in column in order to continue the attack or to act as a reserve (Figure 4). Both of these variations require that the

supporting unit or the following unit be able to identify the location of the assault force in order to apply their fires or to maneuver.[18]

Although the linear assault is specifically designed for units with little or no NVE, there are several valuable points to be made in regard to the night attack in general. The linear tactic compensates for control and orientation problems by moving and aligning units in a rigid fashion. It specifically addresses the loss of visual perception by placing units and individuals in physical contact with each other. The assaulting element's fires and their movement maintain a consistent directional orientation by ensuring that every soldier moves on line straight across the objective. A result is that fires are distributed across the objective rather than focused on a decisive point. The enemy must be defeated everywhere at once rather than in a sequential fashion.

The doctrinal publications that describe the tactical framework for the night attack emphasize the night attack with NVDs as the preferred method for light infantry forces to employ.[19] This is in recognition of the fact that the existing light infantry force is specifically equipped and manned to support this type of combat. It also flows logically from our broader doctrinal tenets that seek to conduct continuous operations. Implicit in both the doctrinal and tactical concepts is the need for NVT to overcome the constraints imposed by the darkness. The technology is the glue that holds the tactical system together and facilitates the success of the night attack. For this reason, it is critical to understand the capabilities and limitations of night vision systems we use, and

to understand how they interface with the users and the environment. Without this knowledge, the night attack becomes an extremely risky undertaking.

III. Night Vision Technology and the Night Attack

> Weapons and equipment must do more than just perform. Their design must also harmonize with the tactical system they are ensconced in.[20]

In 1977, Major General Willard Latham, the Commandant of The Infantry School, noted that NVT had so outdistanced our night fighting tactics that we needed to reconsider the process and find a better way to do it.[21] His recognition of this shortcoming prompted the integration of the technology into a new tactical framework that resulted in the night attack with NVDs that was just described. It is interesting to note that the current commandant, Major General Jerry White, recently criticized our current tactics for the night attack on the grounds that the NVT we have does not support the tactical concept that was originally envisioned.[22] The immediate question that comes to mind is what happened in the last fifteen years to cause this change in attitude? Either the tactics that we designed to exploit the technology were incorrect or the technology is not what it appeared to be.

The place to start investigating this question is with the equipment that is used to facilitate night attacks. The technology that night vision systems rely on, the performance characteristics of the equipment, how the equipment

performs in the environment of combat, and how the soldiers and units adapt to the equipment are all measurable and describable aspects of the problem of integrating night vision systems into the night attack. The question then becomes: what are the capabilities and limitations of NVT within the context of the environment they are used in and the organizations that use them?

The NVE that we employ today rests on three types of technology: active infrared illumination, image intensification of ambient light, and thermal gradient imagery. Each has unique capabilities and limitations that impact on their use in the combat environment (Figure 5).

Active infrared (IR) uses an optical system that can detect IR light that is normally not in the range of human vision. Devices based on this technology use an IR light source to illuminate the desired target and then the light reflected from the target is observed through a viewing system. IR illumination is the major drawback all of these systems have. The beam of light is visible to any other IR system, and to image intensifiers and thermal imagery systems. Active IR is still in widespread use in ex-Soviet armies (and their former clients), The Peoples Republic of China and North Korea.

Image Intensification (I2) systems operate by greatly magnifying the ambient light that exists in all conditions except absolute darkness. Moonlight, starlight, and reflected background light are all sources of ambient light that an I2 device can magnify. There are four successive generations (0, I, II, and III) of I2 devices, each representing a qualitative improvement over its predecessor.

Although the 0 generation is practically obsolete, generation I, II, and III devices are present in one form or the other in all major armies. I2s have moderate ranges and their performance is proportional to the amount of available light. Any atmospheric or battlefield condition such as rain, snow, fog, or light vegetation greatly decrease their effectiveness. Generally the more light that is available the better they work; however, when exposed to bright light (muzzle flash, illumination rounds, explosive flash), a condition called blooming occurs which renders the device ineffective for different periods of time depending on the brightness and duration of the exposure.

Thermal imagery (TI) operates by detecting and amplifying the low level radiation that is emitted by all objects. A thermal sensor translates the radiation into a viewable image based on the thermal temperature gradient that exists within the viewing area. TI devices are passive and have the capability of detecting targets at extended ranges. Unlike I2 devices they can also detect targets through smoke, fog, rain, snow, haze, and light vegetation. Although TI devices are far superior to any system based on I2 technology they are bulky, heavy, and are very expensive. Their distribution is currently limited to a few of the larger armies.

A problem common to all the technologies is target identification. The images they produce appear lifelike in shape and form only; details that can be seen with normal daylight vision are not easily recognizable. Depending on the

range to the target and the type of device exact identification of targets can be difficult.

Operating at the next level below the technology are the devices that allow us to fight at night. These systems offer unique advantages, but also cause numerous physical and psychological problems as the soldier is integrated into the technology. These problems tend to degrade the performance of the soldier and detract from the usefulness of the NVDs as we try to employ them in the combat environment.

From the physical perspective, our eyes are designed for daylight use. At night we rely on the dark adaptation reaction to compensate for the lack of light. Once our eyes exposed to bright light it takes approximately thirty minutes for them to completely recover to a dark environment.[23] Our current inventory of NVDs all expose the soldier's eyes to bright light when in use. When the soldier removes a night sight from his eye, he is blind in that eye (or both eyes in the case or night vision goggles (NVG)) until his night vision recovers. They also produce a tunnel vision effect and spatial orientation problems because of their narrow fields of view and two dimensional representation of the environment.[24]

These problems are magnified by the functional nature of the equipment we use. All NVDs fall into one of three broad categories based on its intended function as a weapon sight, hand-held or mounted viewing device, or as goggles (Figure 6). Weapons sights and hand-held or stationary viewing devices are

designed to be operated while the user is stationary. Each time one uses them, one must move the eye to the sight or the sight to the eye. It is awkward, if not impossible, to use them to aid movement, and natural night vision is adversely affected each time they are used and removed. Goggles overcome most of the trouble associated with movement because they are worn continuously, but at the same time new problems develop. Goggles are not compatible with day or night sights and have short ranges. You can see and move with them on but you cannot effectively engage targets.

These physical problems are compounded by a psychological problem that soldiers experience while using NVDs. The awkward characteristics of the equipment have caused a perception among soldiers that it is easier not to use the equipment and to just rely on your natural night vision, and senses of hearing, smell and touch to move on the battlefield.[25] It has even been postulated that soldiers would not want to use the equipment in a close quarters fight because of the physical limitations imposed.[26]

From an organizational perspective we attempt to overcome these problems by providing a large number and mixture of NVDs and associated equipment to light infantry units (Figure 7). If we take a single rifle squad, as an example, we see that every soldier is equipped with a night vision sight or goggles. Some of the problems with movement, aiming weapons, and control of fires are overcome by issuing small unit leaders IR aiming lights and through the use of luminous tape, IR chemical lights and IR reflective tape (figure 8).

Additionally night navigation problems are simplified through the use of global positioning system devices.

At higher echelons within the light infantry organizations, there are additional TI systems for antitank weapons. The equipment we use is the best available in terms of range and resolution but it presents a significant problem for the light infantry force as it conducts the night attack. The AN/TAS5 thermal sight for the Dragon missile is only nominally man portable, cannot be used while moving, and must be disassembled every time the system is moved. The AN/TAS4 system for the TOW missile is not man portable, cannot be used during movement and is generally tied to the wheeled vehicle it is mounted on. What this means is any plan that relies on these devices for observation must compensate for their low mobility and stationary operating requirements by positioning them in advance to provide overwatch for an attacking unit or to observe the objective area. Their role in a close quarters fight is negligible except for the supporting fire and observation from a fixed position that is situated in a manner that does not compromise the effort of the moving elements in the attack.

What has been developed so far is the problem of attacking at night in an environment that integrates the attacker, his weapon, and his NVE, but ignores the role that the defender plays. The consideration of the enemy and their NVE is of paramount importance because it adds the dimension of lethality to the battlefield that has been absent from the discussion so far.

The advantage that the defender inherently enjoys is increased through the use of NVDs in a manner that outstrips the advantages the same devices provide the attacker. Because of the stationary nature of the defense, every NVD that the attacker has can be used to detect and engage an attacking force. The majority of an attacker's NVE has reduced capabilities because of the nature of the movement the attacker must make to accomplish his mission. What develops is a situation where a defender with only a modicum of NVE can visually dominate the area he defends, while the attacker who may have a quantitative and qualitative edge in equipment can only use a limited amount of it and is at a disadvantage. Even when the defender possesses significantly lower quality equipment, he can often be at an advantage (Figure 9).

Additionally, the defender can rely on a host of countermeasures to thwart an attacker's night vision advantage. Use of illumination ammunition, flares and other sources of bright light or smoke can degrade or disrupt all of our I2 devices. Of course countermeasures can be used by the attacker too, but the defender enjoys the advantage of rapid application of what ever means he chooses to employ.

The conditions described so far can be accurately portrayed by a series of models that show the capabilities and limitations of NVT in the night attack. The first shows the interaction between the soldier and the NVE he uses. The second, the interaction between the small unit conducting the attack and the

equipment they use. The final model describes the environment of night combat between two opposing forces, one attacking and one defending.

The individual soldier, attacking at night, goes through the same series of steps repeatedly as he moves across the battlefield while using NVE. He detects a potential target, acquires it with his NVD, and identifies it as friend or foe. At this point he aims at the target, engages it, and then uses his NVD to assess the results. He may have to repeat the aim-engage-assess steps to ensure he achieves the desired effect on the target. This is the Individual Night Vision Device Targeting Cycle (Figure 10). All the elements of the mechanical and mental interaction between the soldier, his target, his weapon and his NVD are integrated into it. The detect, acquire and aim steps may occur simultaneously, but are separated in the model to account for the fact that the soldier may receive target detection and identification information from an external source. Each step relies heavily on the ability to see the target through the use of a NVD and therefore constitutes a reasonable way of evaluating the interaction between the soldier and his equipment.

The factors that impinge on this cycle and effect his ability to successfully execute it stem from the preceding discussions on the equipment and technology, the environment of combat and how the soldier acts in the environment. The factors consist of the equipment, environmental conditions, the soldier, the target, and the environment of combat. In terms of the equipment the principal concerns are the range of the NVE that is used by the

attacker and defender, the constraints that are imposed by the equipment's intended function, and the effects of countermeasures on the equipment. Environmental conditions are those that affect the equipment's capabilities such as ambient light, precipitation and vegetation.

The soldier himself is the third element in the cycle. He is the mental and physical link between the NVE and the weapon he employs. Whether he is moving or stationary, the level of fatigue, visual acuity, experience, and training all figure heavily into the model. The target the soldier seeks to engage is the fourth factor. Its degree of mobility and exposure directly effect the ability to hit it. The final factor is the environment of combat in which the soldier is operating. This is the action that the enemy takes in relation to the attacker. Suppressive fires, illumination and smoke all effect the ability of the soldier to act within the targeting cycle. They can be viewed as elements that interrupt the process.

If we take this process a step further, a small unit targeting cycle can be developed (Figure 11). Essentially it is the same as the individual cycle. Only the aim and engage steps are replaced with direct the engagement of the enemy and control the combat situation. In this cycle, the target becomes the small unit's objective or mission. The factors that operate at this level are the same ones as in the individual cycle, only they operate in a collective sense and the scale of their impact is magnified.

This is especially true in the factors of equipment and the environment of combat. The low mobility, longer range TI systems that are utilized by platoons and companies can play a critical role in the targeting cycle as detection, acquisition and identification means but they must be located and moved in a manner that best supports the execution of the unit's plan. Also, the environment of combat has to be considered from the perspective of the enemy employing countermeasures that can eliminate critical night vision systems that the cycle may depend on.

The small unit cycle has one unique factor. . This is the input and dissemination of information that allows the individuals and subordinate small units to operate in concert with each other. At each small unit level, from the battalion to the squad and individual, the information from the detection, identification, and assessment steps in both cycles interact by allowing higher echelons to direct and control the activities of the lower echelons. At the platoon level and below, this is accomplished visually, an often severely constrained method during a night attack. At higher levels, the information factor impacts on the targeting cycle through the compounding of the lower echelon's direction and control problems. The higher echelon units may have a distorted view of the battlefield because of their inability to see it themselves and the lack of information they receive on it from the lower units.

In both of these models, the target is an enemy soldier or unit that is defending. Since one of the goals of the attacker is to achieve surprise by using

the concealment that the darkness provides and by exploiting night vision capabilities; then it is necessary to assess the defender's ability to counter the intended surprise through the use of his own night vision systems. One way to think about this is to develop a model to judge the relative conditions of the attacker and defender in terms of their night vision capabilities (figure 12).

This model can be applied if we know the state of the defender's NVE in terms of types, general quantities and quality, and we assume that he will employ it. We also must make an assessment of our own capability in light of the factors that degrade its' performance as we attack. What develops is an assessment of the attacker's condition with respect to the defender in the generic terms of supremacy, superiority, parity and inferiority. In a broad sense it gives the attacker an idea of where he stands with respect to his opponent couched in terms of the probability of detecting the defender. It also describes his NVT advantages or disadvantages as he attacks.

What is important to note in the model is that the conditions of parity and inferiority are relative to any action the that the attacker takes to neutralize the enemy night vision systems. This is the starting point for constructing a plan to overcome the advantages a defending enemy may have at a at a specific point. In this sense, the model is a useful tool for the infantry unit that is preparing to conduct a night attack. Through good reconnaissance and a sound plan to counter enemy night vision systems, the attacker can slide up the scale

from a position of inferiority or parity to a position of superiority at a selected point.

This model and the two preceding ones form a foundation for thinking about how a light infantry unit conducts a night attack in the NVT environment. If we apply the considerations that each model contains, we can begin to understand the true role and the realistic capabilities of the devices we seek to exploit, and we can derive new fundamentals or modify old ones that apply to the night attack.

IV. The Night Attack in the Era of Night Vision Technology

Examples of the application of NVT by an attacking light infantry force in a combat situation are relatively scarce. There are however, two sources we can turn to and apply the models discussed in the previous section to gain an understanding of the role that NVT plays in the conduct of the night attack. One source is the account of the Falklands war. The other is the record of unit rotations at the National Training Center. Both cases offer unique insights into the role that NVE plays in the planning and execution of the night attack.

The method used to look at these examples will be to describe two night attacks. One conducted by 42 Commando, Royal Marines against the Argentinian 4th Infantry Regiment at Mount Harriet on the night of 11-12 June 1982. The other, an attack by a light infantry battalion against a motorized rifle

company defending The Whale Gap at Fort Irwin in the Fall of 1992.[27] Each vignette will highlight the action that occurred and the utilization of NVT as a component of the fight. Then each battle will be analyzed in terms of the models previously developed. The goal throughout will be to highlight the unique aspects of the night attack in the era of NVT.

Mount Harriet, East Falkland Island, 1982

> It seemed a perilous march for the entire approach lay across open ground on which it seemed impossible the Argentineans could not fail to see the British if they made use of their night-vision equipment.[28]

42 Commando of the Royal Marines was assigned the most difficult mission of the final assault by 3 Commando Brigade on the Argentinian positions that surrounded Port Stanley during the final days of the war in the Falklands.[29] They were ordered to attack the defensive positions of the 4th infantry Regiment on Mount Harriet at 0100 hours on the night of 12 June. Their attack would anchor the right flank of 3 Commando Brigade's night attack to seize the high ground that dominated the western approaches to Stanley.

42 Commando faced a force of 400 Argentinian infantrymen who had spent the preceding ten weeks preparing their positions for the attack that they were sure would come.[30] Mount Harriet was the dominant terrain feature overlooking the southwestern approaches to Stanley. It was a barren rolling plain dissected by rocky stream beds and a series of rocky outcrops that rose five to six hundred feet above it. The

Argentinians oriented their defense to the west with two companies occupying the forward slope and two on the crest of the hill (Figure 13). A fifth company defended Goat Ridge, one kilometer north of the main position. Three heavy machinegun positions were established on the crest of the mountain and their heavy mortar platoon was sited on the reverse slope. Additionally they had emplaced five minefields between their positions and Mount Challenger to the west.[31]

The Argentinians were equipped with U.S. manufactured NVDs in the form of two AN/TVS4 long range viewers and a large number of AN/PVS2 and AN/TVS2 weapon sights. Most of these systems were new and in working order.[32]

On the night that 42 Commando attacked most of this information was already known to Lieutenant Colonel Vaux, Commander of 42 Commando. He and his unit had spent the preceding week in defensive positions preparing for what they assumed would be an attack on Mount Harriet. They had conducted a series of nightly patrols that had located most of the Argentinian defenses and obstacles and had fired harassing indirect fires at the positions for the better part of the week. The only intelligence shortfall they had was the status of the enemy's night sights. They knew that the Argentinians had them, but they did know what type or their capabilities.[33]

The plan that Vaux developed for the attack was a simple one. He would approach from the southwest. It offered the greatest chance of success and would be the unexpected direction because it went through the minefields.[34] His concept was to establish a battalion assembly area in the saddle between Wall Mountain and Mount Challenger just after sunset on 11 June.[35] From here he would move two companies

forward in column on a single route that they had reconnoitered and secured through and around the minefields (Figure 14). This would bring them to an assault position 800 meters southeast of the crest of Mount Harriet. Vaux's third rifle company would remain on Wall Mountain and conduct a feint just prior to the other companies' main attack. In conjunction with the feint two Milan antitank missile teams would fire at the heavy machine gun positions from sites 1800 meters south and southwest of the objective.

The two assaulting companies would cross the probable line of deployment at 0100 in section columns with two platoons abreast and one platoon following in column. One company would sequentially attack the company positions on the crest of the objective from south to north and then continue the attack to Goat Ridge on order. The other company would attack the positions on the forward slope of Harriet in the same manner. The entire attack would be supported by on call indirect fires from the Commando's mortars, a supporting artillery battery and naval gunfire.

In terms of NVDs, 42 Commando only had a limited number of British IWS night sights for their sniper rifle systems and machineguns, plus they had AN/PVS4s and AN/PVS5s that belonged to a special operations detachment that was attached to the unit.[36] The sniper systems were positioned on the probable line of deployment, while the special operations detachment was located near Goat Ridge where they could keep the northern flank of the objective under surveillance. Also, a brief illumination mission was planned in conjunction with the feint to disable the Argentinian night sights and to allow the Milan missile gunners to engage their targets.

The execution of the attack was nearly flawless (Figure 15). The feint worked perfectly and the heavy machineguns were taken out of action immediately by the Milans. Artillery fires and naval gunfire was required to suppress the northern part of the objective after the attack got underway, but by the time the sun rose 42 Commando had seized its objective. The Argentinians had lost nearly 100 men and another 300 were prisoners, while 42 Commando had two killed and thirteen wounded in the attack.

The example of 42 Commando is useful because it shows us what to do when the small unit commander is faced with a condition of inferiority in NVE. Vaux had to take measures to counter the enemy's night vision capabilities while making the best of the limited assets he had available.

His plan to use illumination to temporarily disable image intensifiers is an example of a prudent step to take. In 42 Commando's case, it was timed to just precede the main attack and did not unduly alert the enemy because of the program of harassing fires they had maintained earlier in the week. Using a blinding technique is an effective tool if one knows the enemy is using I2 devices and one takes measures to ensure one's own equipment is not disabled at the same time. A quick burst of illumination can also be used to temporarily blind soldiers who are not using NVDs if they are poorly trained. Also, a program of harassing fires can lull the enemy into complacency and set the stage for the further use of fires to conceal the movement and noise of an attacking force as it approaches the objective.

The illumination that Vaux fired also provided the necessary light for his antitank crews to destroy the machinegun positions. The point here is that long range night sights are usually tied to long range weapons. Even if the reconnaissance effort fails to locate NVE, it may be present. It is a sound practice to attempt to destroy any long range weapons systems early on because if there are night sights they will probably be mounted on these weapons.

Reconnaissance and surveillance were probably the most important aspects of Vaux's plan. His efforts in these areas relied heavily on the one night vision equipped unit he had under his control. They were positioned to visually dominate the part of the battlefield that his main attack could not influence until they were near the conclusion of their attack. Also his reconnaissance effort located and secured a route to move on that was free from Argentinian ground troops and out of range of the majority of their NVE.

Vaux's plan for the use of his own IWS night sights placed them in a position where they could provide observation at a critical point on the battlefield. Locating his snipers along the probable line of deployment gave them the advantage of viewing from a stationary position to optimize the capabilities of the sights. They could observe the companies as they made their attacks, and provide directional control, last minute intelligence, and support the attack by placing fires on critical targets.

The company-size feint that 42 Commando used as a precursor to their attack is an example of what can be done to make the enemy's night sights work against him. A feint can draw the attention of the defender's equipment to a specific point on the

battlefield at a critical moment. The narrow field of view of the night sights and viewers can be made to work for the attacker if their attention is focused away from the main effort.

The application of each of these measures assisted 42 Commando in moving up from a position of NVD inferiority to a position of local superiority. With very little equipment and a few ordinary measures they were able to defeat an enemy that had the capability to see them at night long before they actually did.

The Whale Gap, Fort Irwin, 1992

A light infantry battalion was assigned the mission of attacking and defeating an opposing force motorized rifle company. The attack was planned to commence at 0500 hours and was synchronized to support a heavy brigade's attack at 0600 hours of the rest of the motorized rifle battalion[37] (Figure 16).

The motorized rifle company was defending the eastern flank of The Whale Gap's south side with two platoons forward and one platoon back, all oriented to the northwest. They were tied in on their western flank with another defending motorized rifle company. The company had three dismounted observation posts established to their northeast on The Whale, and the battalion had established a platoon size combat security outpost on the north side of The Whale opposite the company's position. There were active mounted and dismounted security and reconnaissance patrols operating throughout the area. The company had been in the position for thirty-six

hours when the attack began and was completely dug in with a wire and mine obstacle system located 600 meters to their front.

The company's NVE consisted of twenty-one pairs of AN/PVS5 NVGs and four AN/PVS4s. These were distributed among the company's observation posts and the two westernmost defending platoons.

The infantry battalion commander developed a plan of attack that included a twelve kilometer infiltration from an assembly area near Red Pass to an assault position one kilometer from the objective (Figure 17). Two of the companies were designated as assault elements and one as a support by fire element. The assault companies were to attack with A Company leading to defeat the northeastern platoon, and B Company following to pass through A Company and continue the attack into the southwestern platoon position. Company C (less one platoon) was to support the entire attack by fire from a position just west of the assault position.

Supporting assets for the attack consisted of the scout platoon, which was to conduct a reconnaissance of the infiltration route and the objective during a thirty-six hour period prior to the attack. The mortar platoon was to provide indirect fires on call from a position one kilometer east of the assault position. The antitank platoon was to air assault into a location six kilometers east of the objective with their vehicles, and then infiltrate to an overwatch position on Hill 592. They were given two missions to accomplish from this position. The first was to keep the objective under surveillance prior to the attack and the second was to engage tanks and BMPs on the

objective when the attack began. The battalion would keep one rifle platoon in reserve in the assault position throughout the attack.

The battalion commander did not develop a specific plan for the use of his NVE or to counter the enemy's equipment. The only actions he took were to position the antitank platoon so that they could overwatch the objective with their thermal sights, and to position scout observation posts around the objective area. All of the battalion's NVE was utilized during the attack except the scout platoon's thermal viewers. Also, the battalion was not equipped with global positioning system and relied on map and compass for navigation. During movement the battalion utilized AN/PVS7 NVGs to aid in navigation.

When the infiltration began at 2300 hours the battalion moved in a column of companies with a thirty minute interval between units. The companies also utilized column formations down to the squad level. During the infiltration the companies were engaged by opposing force reconnaissance elements with minimum casualties, but they did not react because they could not identify the source of the fire. The mortar platoon and the battalion reserve were engaged by a BRDM equipped reconnaissance element and were destroyed as they moved at the rear of the battalion column.

By 0300 hours, A and B Companies had occupied their assault positions and C Company was moving towards their support by fire position. At about this same time, the antitank platoon was engaged and destroyed in rough terrain by a dismounted patrol as they attempted to infiltrate into their overwatch position. At 0440 hours, A

and B Companies completed a leader's reconnaissance of the objective area and were prepared to attack. At about the same time C Company had become disoriented and decided to establish their support by fire position where they were rather than continue movement. They were 800 meters west of their intended position.

At 0500, A Company began their assault with two platoons on line and one, with six Dragon missile systems, in a support position on their right flank. The company commander initiated the attack with direct fires at 0520 hours destroying two tanks and one BMP as the assault force closed on the objective and engaged in small arms fight with approximately thirty dismounted troops. Company C attempted to support this action with machinegun fire but they were out of range, and their Dragon teams were not prepared to fire.

As A Company secured their objective, B Company passed through them with three platoons on line to continue the attack. Approximately 400 meters after they began their assault they were engaged by opposing force direct fire and friendly indirect fire. They were rapidly reduced and became combat ineffective. At this time, C Company was directed to move from their support by fire position to continue B Company's failed attack; however, they were unable to move because of heavy indirect fire. At 0640, lead elements of a friendly tank battalion had closed on A Company's position and were preparing to pass through to continue the attack.

At the end of the battle, the light battalion had destroyed one motorized rifle platoon, a dismounted platoon and two other armored vehicles. Eleven of their original twenty-seven rifle squads were still combat effective. They had also lost all of

their antitank and mortar assets. The battalion had failed to accomplish its assigned mission.

In this case, a battalion that could have easily achieved superiority in NVT failed to do so. With few exceptions they were detected and engaged by the enemy before they were able to detect the enemy. There are several possible reasons for this failure that can be brought out by examining the small unit and individual targeting cycle models.

As the battalion conducted their infiltration, they were engaged by the enemy several times at ranges of 500 to 600 meters without ever detecting who had fired on them. Their problem was that they were relying exclusively on NVGs while their longer range I2 systems were mounted on weapons and not in use. The opposing force reconnaissance elements were using AN/PVS4s to observe them long before any soldier in the unit knew they were there.

The battalion's scout elements that were located on The Whale were relying on AN/PVS4s and NVGs to keep the objective under observation. This reduced the effective range of their vision to 600 meters which effectively eliminated them from the fight. If they had their thermal viewers with them they would have been able to observe everything on the objective and the final segment of the battalion's infiltration lane where most of the early casualties occurred. Proper equipment and the selection of good observation posts could have aided in the overall conduct of the attack.

A large component of the commander's plan to keep the objective under surveillance was compromised when the antitank platoon was destroyed. This platoon

was attempting to move cross-country using NVGs for driving and navigation. They were detected and engaged before they could react, and as a result the battalion lost its' best long range night vision systems. The heavy antitank TI system is a good piece of equipment, but it cannot be used on the move. The antitank platoon was relying on its' only other night vision resource, the NVGs, to get into their position. They were destroyed by an opposing force patrol that only had one pair of NVGs and small arms weapons. The loss of this resource left a critical gap in the commander's information gathering system and there was no plan to provide a back up system to cover the loss.

The battalion's lack of a plan to effectively employ the eighteen Dragon night sights is also a major failure. These systems serve a dual role of being able to provide information on the battlefield and to engage armor. The lack of a plan to distribute their capability in overwatch positions during movement, and in locations that provide both a field of fire and overlapping coverage of the objective, caused leaders at all levels to fight blind.

The light infantry battalion failed in their night attack because they were consistently detected and engaged as they moved across the battlefield. They had the assets available to visually dominate the area they moved through and attacked into, but did not take the appropriate measures to ensure that their NVE was used to its' full potential.

Comparing the light infantry battalion's night attack and 42 Commando's attack brings to light an important question. Why did a unit that was markedly inferior in

NVE succeed, while a fully equipped light infantry battalion fail as they executed similar attacks?

V. Integrating Technology and Tactics

During eight recent unit training rotations at the Joint Readiness Training Center, light infantry battalions and companies failed in their attempts to conduct night attacks seventy percent of the time.[38] This statistic does not speak well of our units' ability to conduct a tactical operation that is supposed to be one of their principal missions. In the after action reports for these missions units are consistently criticized in terms of poor planning, lack of control measures, piecemeal commitment of forces, and the like. These criticisms, although valid, do not address the underlying problems that the light infantry units are having in the night attack.

The previous sections have highlighted some of the unique aspects involved in the execution of our night attack tactics in the environment of NVT. Analysis of these highlights reveals some interesting trends that are indicative of where our problems with the night attack really lie.

The first of these trends is that we do not have a solid technical understanding of the NVE we attempt to tactically employ. The capabilities of the equipment are constrained in numerous ways varying from the technology that supports the equipment to the functional nature of the various pieces of hardware. The way that the equipment works, and the way that the soldier and the small unit leader interact

with the equipment, provide meaningful limitations on its' use. There must be a firm understanding of these limitations in order to have a source of knowledge that will allow the proper employment of NVE.

In the same vein, we tend to underestimate our opponent's capabilities. The point that a defender with meager night vision capabilities can often have a visual advantage over an attacker with a full compliment of equipment has been forgotten by some infantrymen, or is ignored by them. This is a source of many of the failures that we observe at our training centers. The attacking unit is observed by the defending unit, they are engaged before they are prepared to fight, and defeated as a result.

Central to this issue is the recognition that the night attack is fundamentally a search for the element of surprise. The actual tactic that we employ or the NVE that we have is meaningless if we are discovered before we are ready to attack. Darkness is the environmental condition that we try to exploit as we attack at night. It conceals our location and allows us to close with the enemy at an unexpected time and place to achieve surprise and reap the benefits that it can bestow. The NVT that we possess gives us a new means to this end. The problem is that it is often looked on as a panacea that solves the problems inherent with any nighttime activity and will achieve surprise in its own right. This is far from the truth. It is in reality a tool that makes that makes doing some things at night easier, but achieving surprise is not one of them.

The panacea can also be seen in our application of the fundamentals of the night attack. The abundance and quality of NVE have apparently caused us to drift away from certain time tested-principles that have guided the night attack in the past.

Although our doctrinal publications still stress them, their application in practice is lacking. Contrast the example that 42 Commando presented in the Falklands with the light infantry battalion's attack at The Whale Gap. Detailed reconnaissance, surveillance of the objective, maintenance of direction, control of fires, and limited depth objectives all were lacking at The Whale and all were present on Mount Harriet. NVT does not negate the principles, it only alters them slightly based on an increased ability too see at night.

The unconsidered use and employment of NVT is a good general description of where we stand today. We have failed to realistically integrate a technological innovation into our tactical system, and as a result are having difficulties in executing a basic infantry mission. This problem has occurred more as result of our failure to understand the capabilities and limitations of the machine rather than a failure of the technology or the tactics.

VI. Conclusion and Recommendations

As result of the study of the impact of NVT on the night attack by light infantry, I have reached a conclusion and several recommendations that will hopefully provide some insight into the problem of the infantry night attack. My basic conclusion is that the tactical framework for the night attack is sound. It is based on long-standing principles and fundamentals that apply at all times, day or night, and they transcend the technological problems that are bearing on the problem. Where we

do have a problem is in how we treat the principal tools that we rely on as we conduct night attacks. Our NVT is the main enabling device that allows us to conduct the types of night attacks envisioned in the doctrinal publications. The way we apply those devices as we conduct the attack is where we have erred. NVT has specific limitations that stem from its inherent capabilities and limitations, from the soldier and small unit leader's interface with the equipment, and from trying to apply the technology in an enemy free vacuum. Recognizing these shortcomings is the key to effectively applying the technology within the existing tactical system.

In order to address the immediate problems that we face, we need to do several things. First is to make sure that we understand the specific limitations that the equipment we use today has within the context of the attacker. We cannot accept the technology at its face value. It must be reduced by an amount equal to those components in the system that limit it. Specifically how the soldier and leader interface with the equipment in terms of soldier's ability to move and shoot with the equipment and how the small unit leader can utilize the equipment in the most efficient manner to accomplish his mission.

The next immediate problem is to make sure that our plans reflect an accurate assessment of the enemy capability to see us with his equipment. We must actively work to place the enemy at a disadvantage while we maintain our own. A plan for the night attack that ignores this, also ignores the most basic concept attached to the night attack--the search for surprise. Our plan must ensure that we are not seen or surprise will be lost.

The last thing that we must do is to continue to comply with the basic principles and fundamentals of the night attack. We have to learn to apply the basics in concert with NVT rather that letting an infatuation with the technology steer us away from the basics.

Limited Visibility Attack with Night Vision Devices[39]

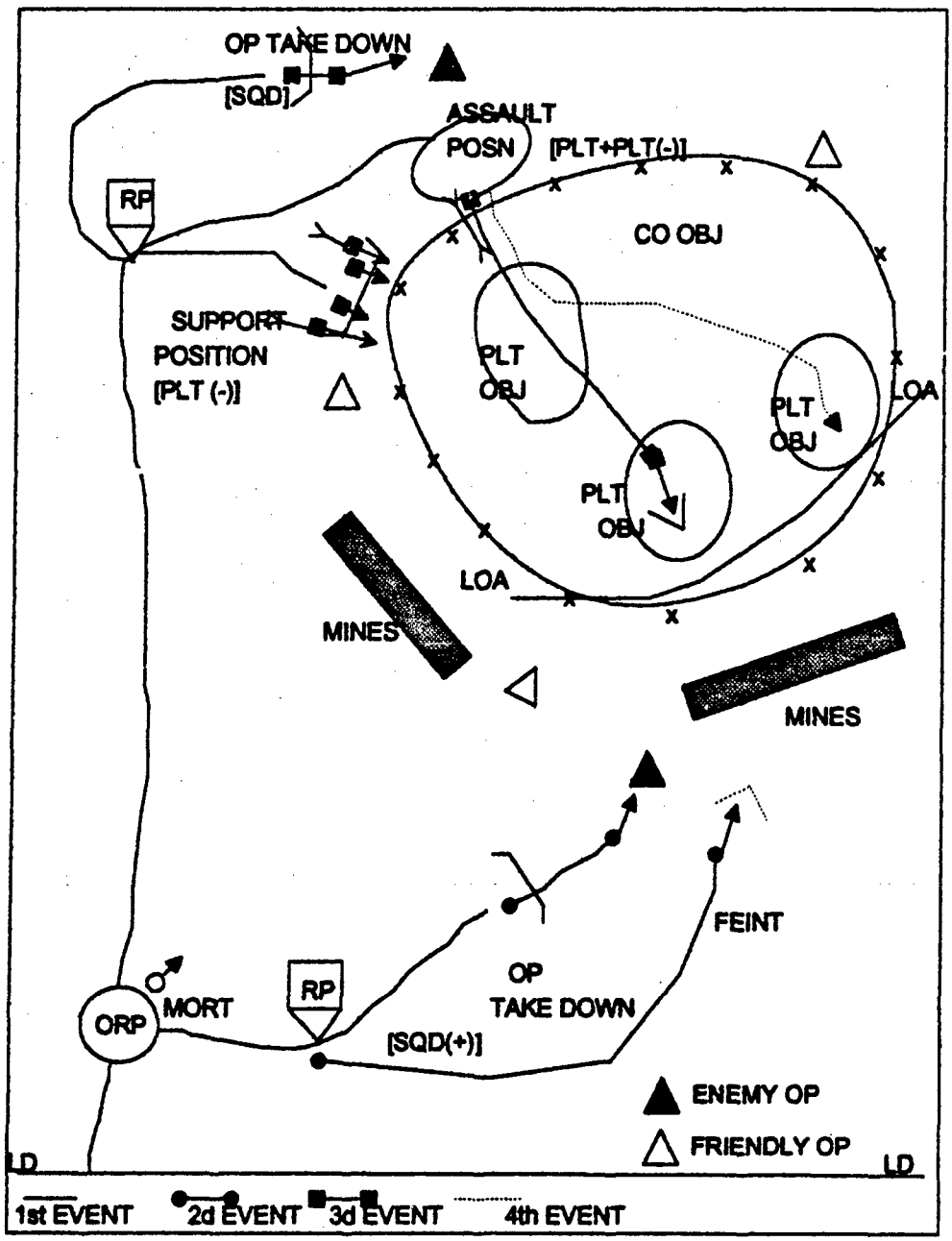

Figure 1

Linear Assault[40]

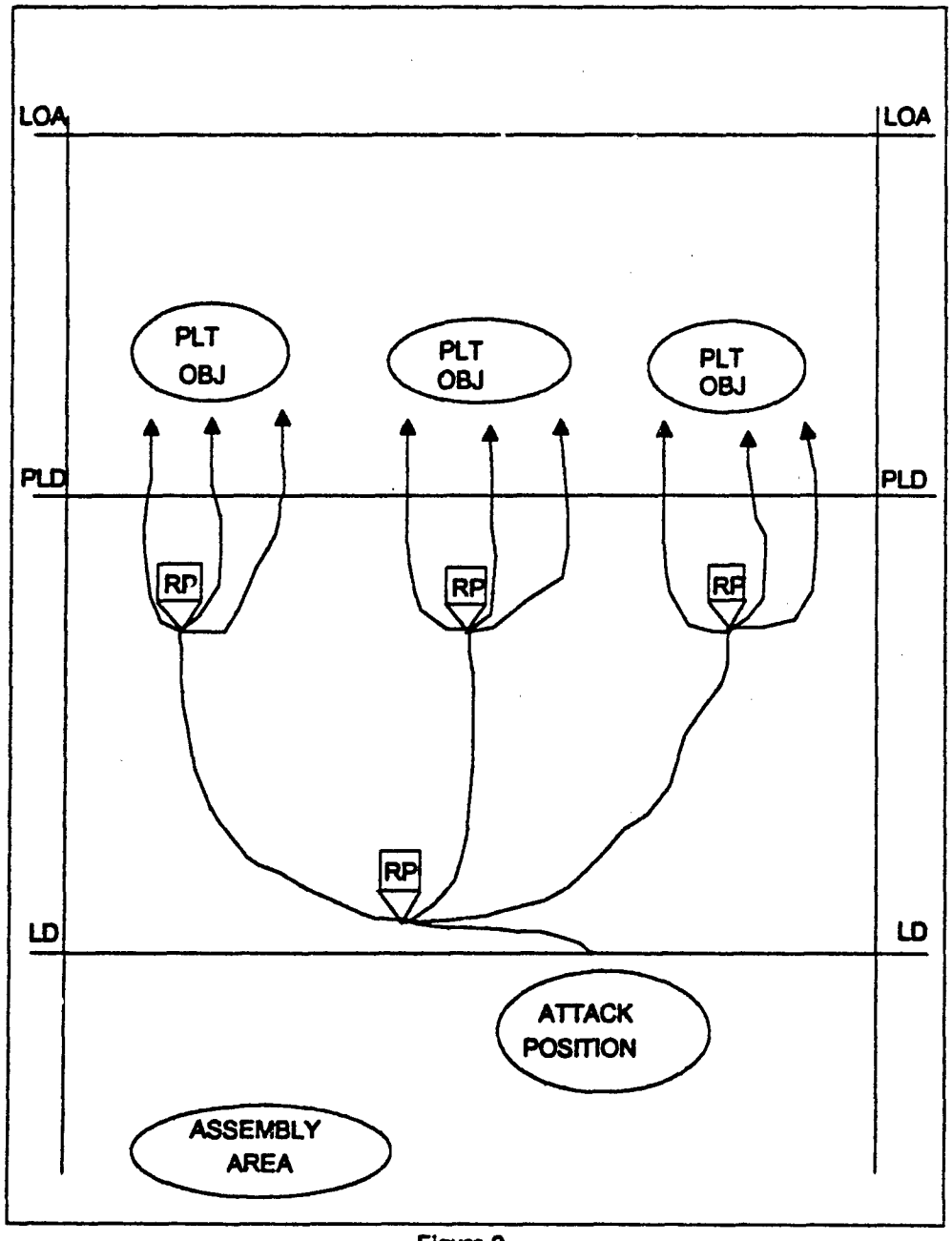

Figure 2

Linear Assault with Support Element[41]

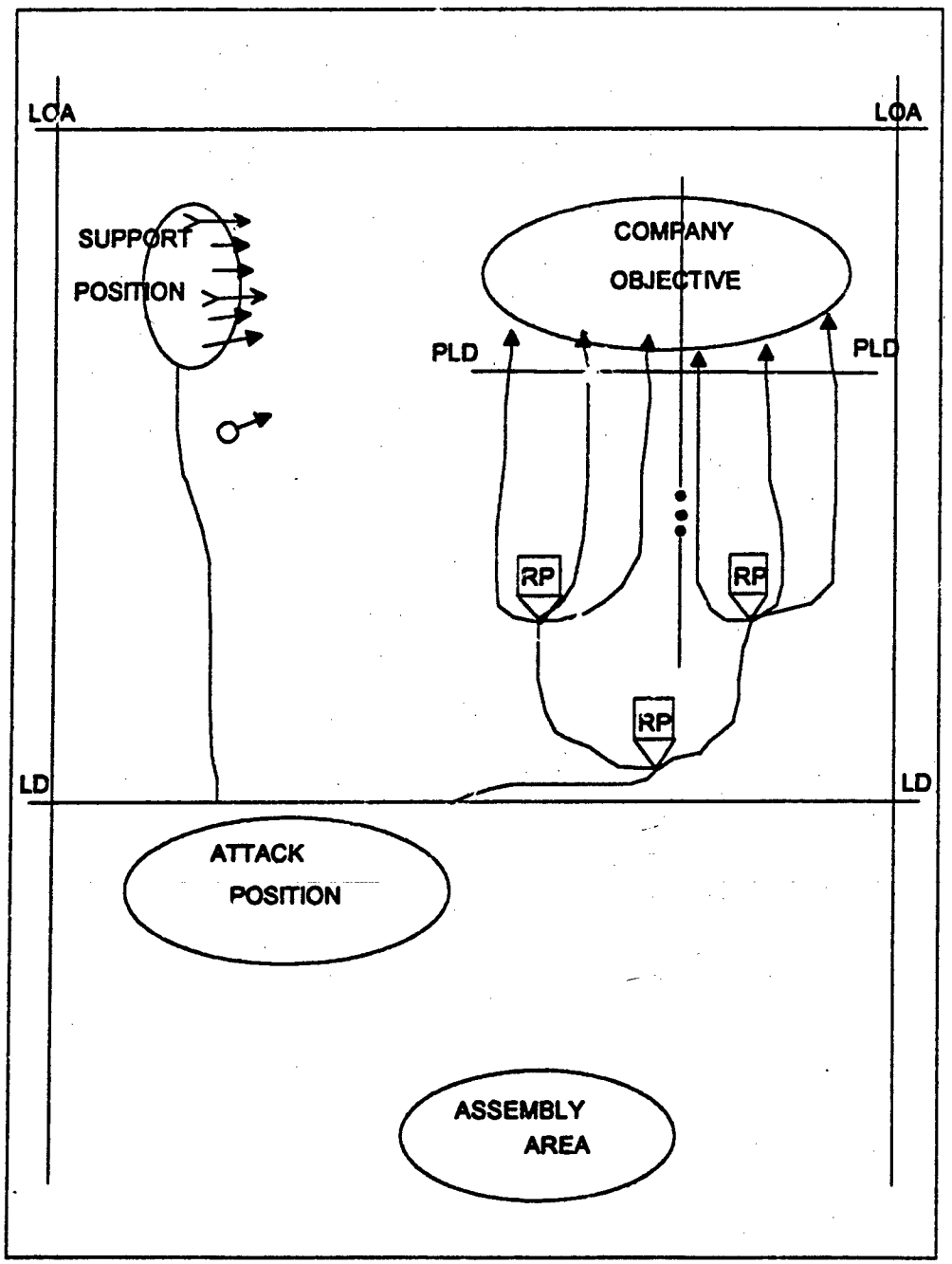

Figure 3

Linear Assault with Follow and Support[42]

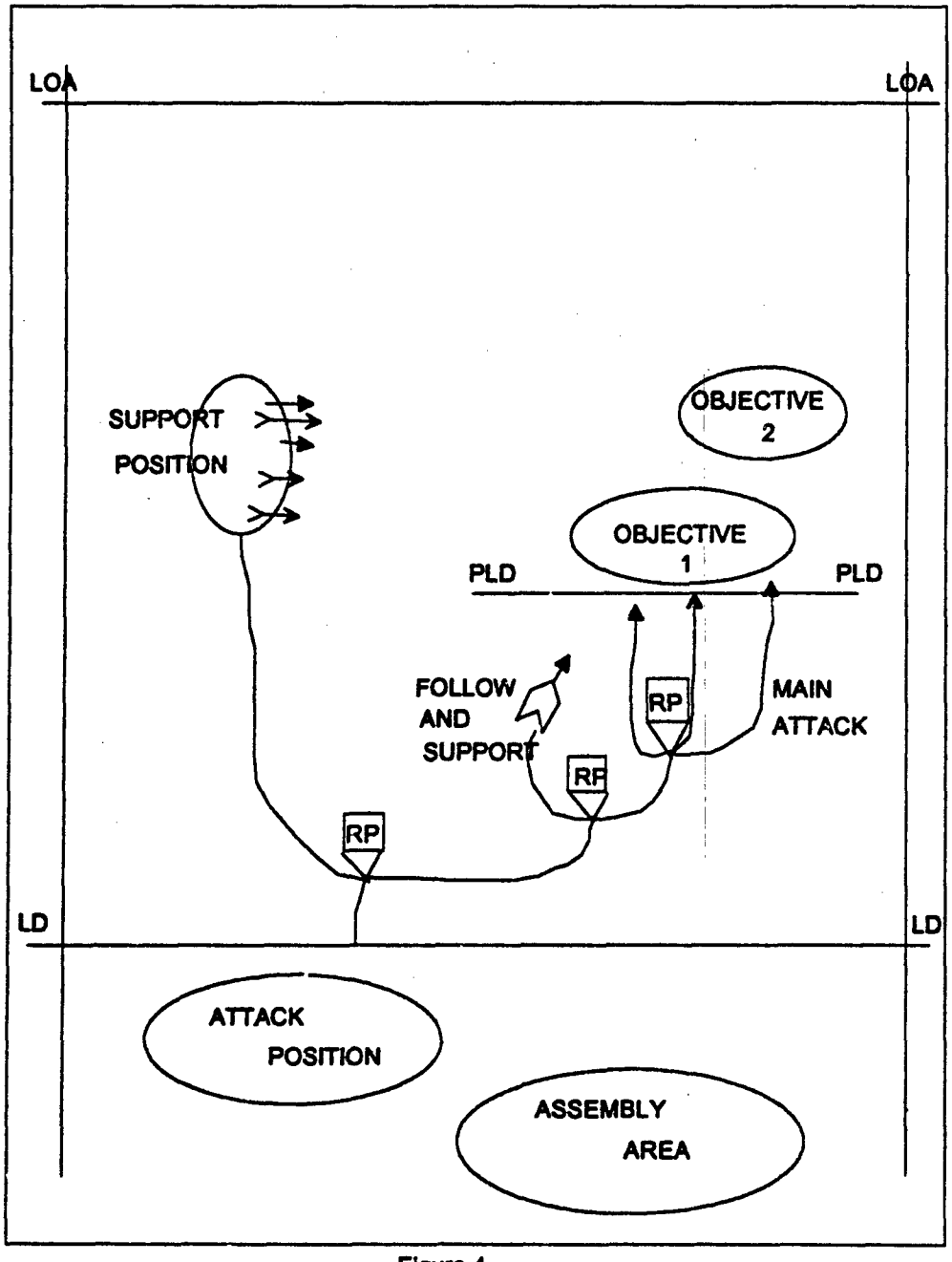

Figure 4

Comparison of the Types of Night Vision Technologies[43]

TECHNOLOGY BASE	VIEWING METHOD	ADVANTAGES/ DISADVANTAGES
INFRARED	ILLUMINATION WITH INFRARED LIGHT, OBSERVATION WITH INFRARED VIEWER	HIGH POWER INFRARED LIGHT SOURCE HEAVY DETECTABLE BY ANY SYSTEM
IMAGE INTENSIFICATION	AMPLIFICATION OF AMBIENT LIGHT (STAR, MOON, BACKGROUND)	ALL REQUIRE AMBIENT LIGHT SOURCE
GENERATION 0	IMAGE INTENSIFICATION OF LOW LEVEL IR LIGHT	LOW POWER IR LIGHT SOURCE HEAVY DETECTABLE CAN BE USED FOR PASSIVE VIEWING AT VERY CLOSE RANGES
GENERATION I	IMAGE INTENSIFICATION OF AMBIENT LIGHT	PERSISTENT/FLOATING IMAGES LONG DURATION BLOOM POOR RESOLUTION HEAVY/BULKY DAMAGED BY BRIGHT LIGHT NOT DETECTABLE
GENERATION II	IMAGE INTENSIFICATION OF AMBIENT LIGHT	MODERATE BLOOM RELIABLE LIGHT WEIGHT AUTOMATIC SHUT OFF SYSTEMS NOT DETECTABLE
GENERATION III	IMAGE INTENSIFICATION OF AMBIENT LIGHT	EXCELLENT RESOLUTION TEMPORARY BLOOM AUTOMATIC SHUT OFF FOR BRIGHT LIGHT RELIABLE LIGHT WEIGHT NOT DETECTABLE
THERMAL IMAGERY	IMAGE INTENSIFICATION OF LOW LEVEL THERMAL RADIATION	NARROW FIELD OF VIEW LONG RANGE HIGH RESOLUTION VERY HEAVY MODERATELY RELIABLE VIEW THROUGH SMOKE, FOG, RAIN AND LIGHT VEGETATION COOLANT SYSTEM

Figure 5

The Infantry Battalion's Night Vision Equipment[44]

NOMENCLATURE	TYPE DEVICE	I2 GENERATION	USE	FIELD OF VIEW	RANGE[1]
SIGHTS					
AN/PVS2B	I2 PASSIVE	I	SMALL ARMS	10	400/300 (MAN)
AN/PVS4	I2 PASSIVE	II	SMALL ARMS	15	600/400 (MAN)
AN/TVS2B	I2 PASSIVE	I	CREW SERVED	10	800/500 (VEH)
AN/TVS5	I2 PASSIVE	II	CREW SERVED	9	1200/1000 (VEH)
AN/TAS5	THERMAL	--	DRAGON AT MISSILE SIGHT	5	1000 (MAN/VEH)
AN/TAS4	THERMAL	--	TOW AT MISSILE SIGHT	7	3000+ (MAN/VEH)
VIEWERS					
AN/TVS4	I2 PASSIVE	II	TRIPOD MOUNTED VIEWER	9	2000/1200 (VEH)
AN/PAS7	THERMAL	--	HAND HELD VIEWER	5	1000 (MAN/VEH)
GOGGLES / AIMING LT[2]					
AN/PVS5B	I2 PASSIVE/ ACTIVE	II/III	GOGGLES	40	150/50
AN/PVS7B	I2 PASSIVE/ ACTIVE	II/III	GOGGLES	40	150+/50+
AN/TAS6[3]	THERMAL	--	TRIPOD MOUNTED VIEWER	9	13000 (VEH) 3500 (MAN)
AN/PAQ4A[4]	IR ACTIVE	--	AIM LIGHT	--	150

[1] Ranges for I2 devices are indicated in maximum range moonlight/maximum range starlight format. MAN indicates standing personnel target, VEH indicates medium armored vehicle, flank view.

[2] Both types of night vision goggles have user activated IR light that has a 3 meter range.

[3] This device is found in infantry battalions with an attached combat observation lasing party from a field artillery battalion's headquarters battery.

[4] The aiming light produces an IR beam visible through any night vision equipment. It can be used to aim weapons or to control the fires of weapons by a small unit laser.

Figure 6

Distribution of Selected Night Vision Equipment in an Infantry Battalion[45]

RIFLE SQUAD

DUTY POSITION	NIGHT VISION	WEAPON
SQUAD LEADER	AN/PVS7 AN/PAQ4	M16A2
TEAM LEADER	AN/PVS7 AN/PAQ4	M16A2
AUTO RIFLEMAN	AN/PVS4	M249
GRENADIER	AN/PVS7	M203
RIFLEMAN	AN/PVS7	M16A2
TEAM LEADER	AN/PVS7 AN/PAQ4	M16A2
AUTO RIFLEMAN	AN/PVS4	M249
GRENADIER	AN/PVS7	M203
RIFLEMAN	AN/PVS4	M16A2

RIFLE PLATOON HEADQUARTERS

DUTY POSITION	NIGHT VISION	WEAPON
PLATOON LEADER	AN/PVS7 AN/PAQ4 AN/PSN 8	M16A2
PLT SERGEANT	AN/PVS7 AN/PAQ4	M16A2
RADIO OPERATOR	AN/PVS7	M16A2
MACHINEGUNNNER	AN/PVS4	M249/M60
ASST MACHINEGUN	AN/PVS7	M16A2
MACHINEGUNNER	AN/PVS4	M249/M60
ASST MACHINEGUN	AN/PVS7	M16A2
ANTITANK GUNNER	AN/TAS5	DRAGON MISSILE
ASST ANTITANK	AN/PVS7	M16A2
ANTITANK GUNNER	AN/TAS5	DRAGON MISSILE
ASST ANTITANK	AN/PVS7	M16A2

RIFLE COMPANY HEADQUARTERS

DUTY POSITION	NIGHT VISION	WEAPON
COMMANDER	AN/PVS7 AN/PSN8	M9
EXECUTIVE OFF	AN/PVS7 AN/PAQ4	M16A2
FIRST SERGEANT	AN/PVS7 AN/PAQ4	M16A2
RADIO OPERATOR	AN/PVS7	M16A2
RADIO OPERATOR	AN/PVS7	M16A2
MORTAR SGT	AN/PVS7	M16A2
MORT SECT SGT	AN/PVS7	M16A2
MORT GUNNER	AN/PVS7	M9/60 MM
ASST GUNNER	AN/PVS7	M9
MORT GUNNER	AN/PVS7	M9/60MM
ASST GUNNER	AN/PVS7	M9

BATTALION SCOUT PLATOON

14X AN/PVS7 14X AN/PAQ4 3X AN/PSN8
3X AN/PAS7 6X AN/PVS4 3X AN/GVS5

BATTALION ANTITANK PLATOON

6X AN/PVS7 2X AN/PAQ4 4X AN/TAS4

Figure 7

Target Acquisition, Fire Control and Navigation Aids[46]

NOMENCLATURE	TYPE DEVICE	RANGE/DESCRIPTION
AN/GVS5	TARGET ACQUISITION LASER RANGE FINDER	10000 METERS
AN/PSN8	NAVIGATION	GLOBAL POSITIONING SYSTEM RECEIVER ACCURATE TO ± 15 METERS
MISCELLANEOUS	CHEMICAL LIGHTING	IR AND COLORED LIGHTS FOR MOVEMENT AND FIRE CONTROL
	GLINT TAPE	IR REFLECTIVE TAPE FOR MOVEMENT AND FIRE CONTROL
	LUMINOUS TAPE	GLOW IN THE DARK TAPE FOR MOVEMENT CONTROL

Figure 8

Selected Russian, Chinese and North Korean Night Vision Devices[47]

NOMENCLATURE	TYPE DEVICE	I2 GENERATION	USE	RANGE
SIGHTS				
APN2	I2/IR PASSIVE/ ACTIVE	0	CREW SERVED WEAPONS	900 (MAN)
NSP2	I2/IR PASSIVE/ ACTIVE	0	SMALL ARMS	400 (MAN)
APN3	IR ACTIVE	–	ANTITANK WEAPONS	2000 (VEH)
APN57	IR ACTIVE	–	ANTITANK WEAPONS	700 (VEH)
PPN1	IR ACTIVE	–	CREW SERVED WEAPONS	300 (MAN)
PPN2	IR ACTIVE	–	CREW SERVED WEAPONS	500 (MAN)
PPN3	I2 PASSIVE	I	CREW SERVED AND SMALL ARMS	400 (MAN)
GOGGLES				
PNV57	IR ACTIVE	–	VEHICLE DRIVER'S	100 (MAN)

Figure 9

Individual Night Vision Device Targeting Device Cycle

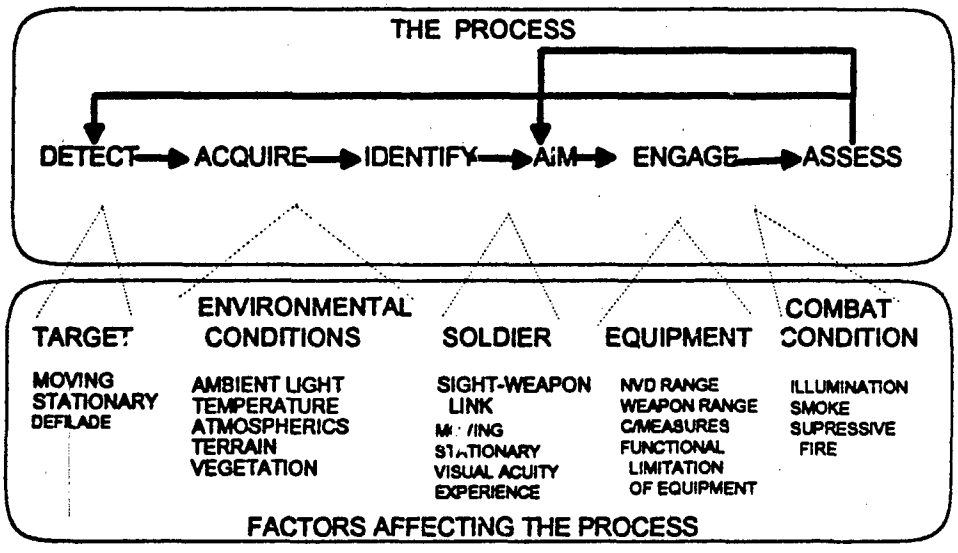

Figure 10

Small Unit Night Vision Device Targeting Cycle

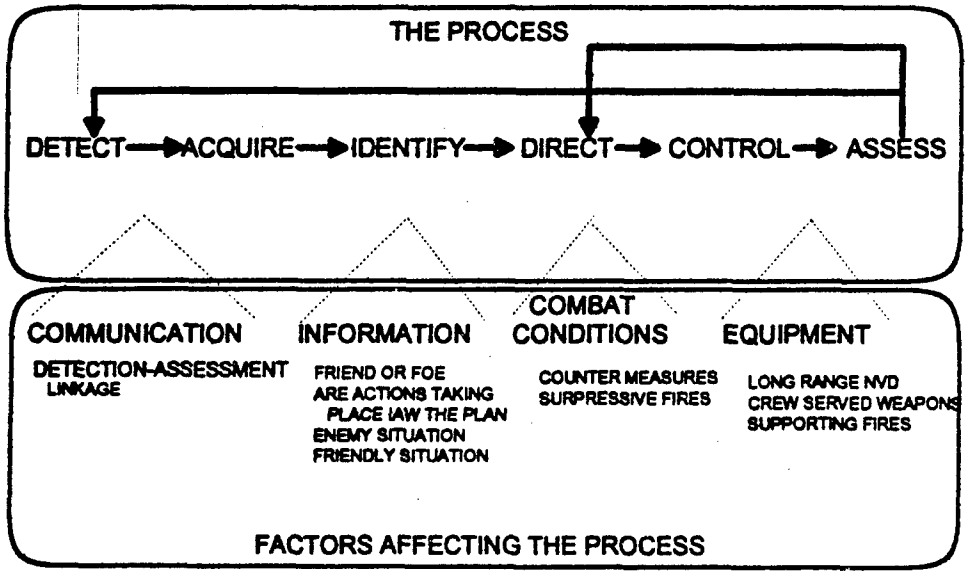

Figure 11

Attacker's versus Defender's Relative Night Vision Advantage

ATTACKER'S CONDITION WITH RESPECT TO THE DEFENDER[1]	DESCRIPTION	PROBABILITY OF ATTACKER DETECTING DEFENDER FIRST[2]
SUPREMACY	ATTACKER DOMINATES THE NIGHT BATTLEFIELD DEFENDER HAS NO NIGHT VISION CAPABILITY	1.00
SUPERIORITY	ATTACKER DOMINATES THE NIGHT BATTLEFIELD AT MOST POINTS, OR CAN DOMINATE THE BATTLEFIELD AT SELECTED POINTS[3]	>0.50 (AT SELECTED POINTS)
PARITY	ATTACKER AND DEFENDER HAVE EQUAL NIGHT VISION CAPABILITY	=0.50
INFERIORITY	ATTACKER IS QUALITATIVELY AND QUANTITATIVELY INFERIOR IN NIGHT VISION CAPABILITY DEFENDER DOMINATES THE NIGHT BATTLEFIELD	<0.50

[1] Conditions are based on a moving attacker and a stationary defender. The defender can employ all his night vision equipment, while the attacker only employs that equipment that operates during movement.

[2] Generic probabilities were assigned to reflect which party, attacker or defender, has the relative advantage.

[3] Achieving superiority at a selected point reflects the attacker's prerogative of choosing the time and place for the attack. It also reflects the possibility that the attacker can move from a position of inferiority or parity to temporary superiority if extraordinary measures are taken.

Figure 12

Order of Battle, 42 Commando and 4th Infantry Regiment, 12 June 1982[48]

4th Infantry Regiment and Supporting Units Defending Mount Harriet

Headquarters Element	
41 Rifle Company	Approximately 70 soldiers were
42 Rifle Company	assigned to each of the companies
43 Rifle Company	
44 Rifle Company	
45 Rifle Company	
Heavy Mortar Platoon	Four 120mm mortars
Heavy Machinegun Section	Three caliber .50 machineguns
Howitzer Battery	Six 155mm howitzers in general support
Commander	Lieutenant Colonel Sona

42 Commando, Royal Marines, 3 Commando Brigade, Attacking Mount Harriet

Headquarters Element	
J Company	(M Company was detached)
k Company	Approximately 100 men were assigned
L Company	to each company
Mortar Platoon	Three 81mm mortars
Antitank Platoon	Four Milan missile systems
Reconnaissance Platoon	
Engineer Platoon	
Special Operations Det	Cadre from arctic warfare school
Howitzer Battery	Six 105mm howitzers in direct support
Naval Gunfire Support Group	Five inch guns in general support
Commander	Lieutenant Colonel Vaux

Figure 13

Vaux's Plan of Attack[49]

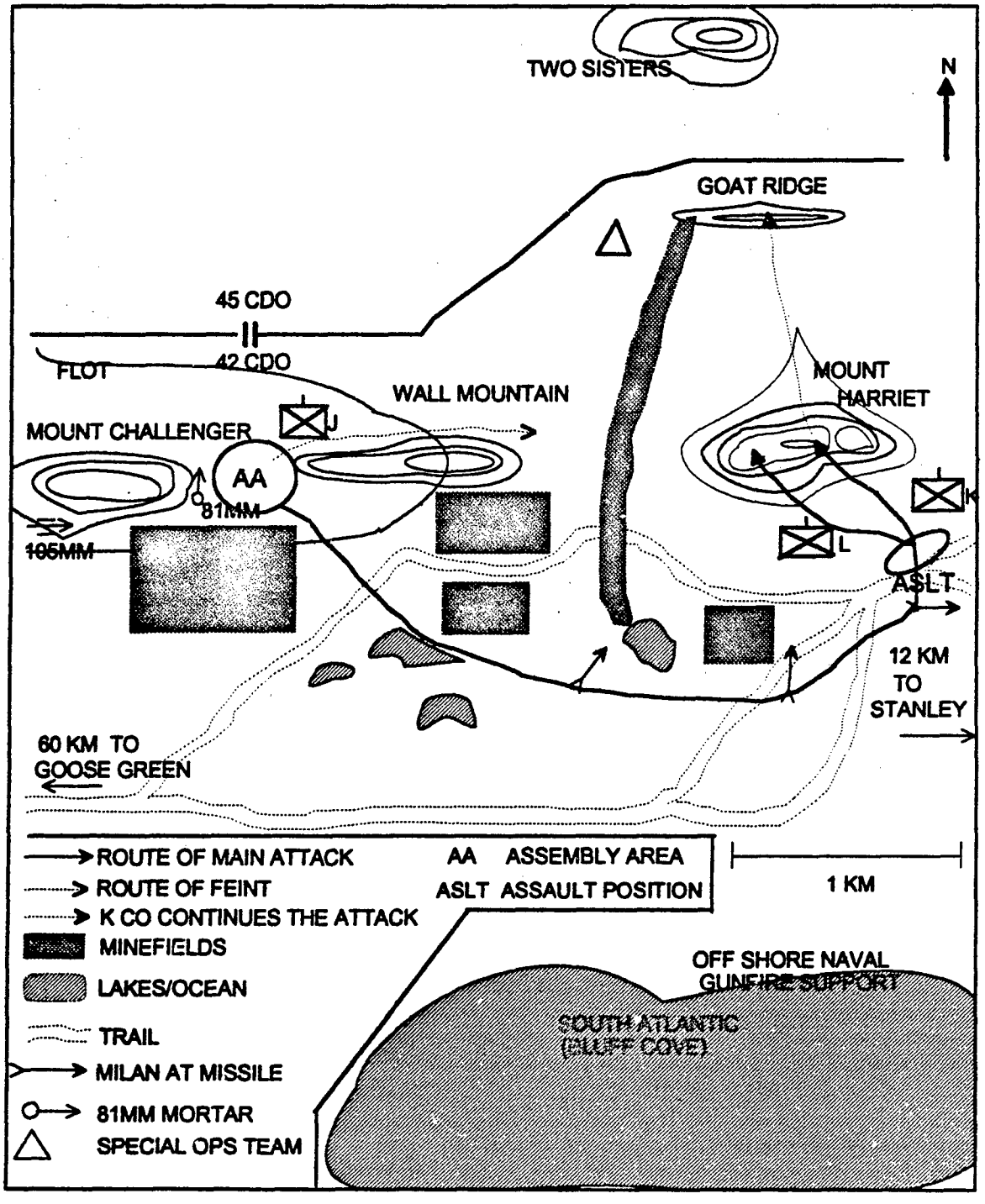

Figure 14

Argentinian Defenses and 42 Commando's Attack[50]

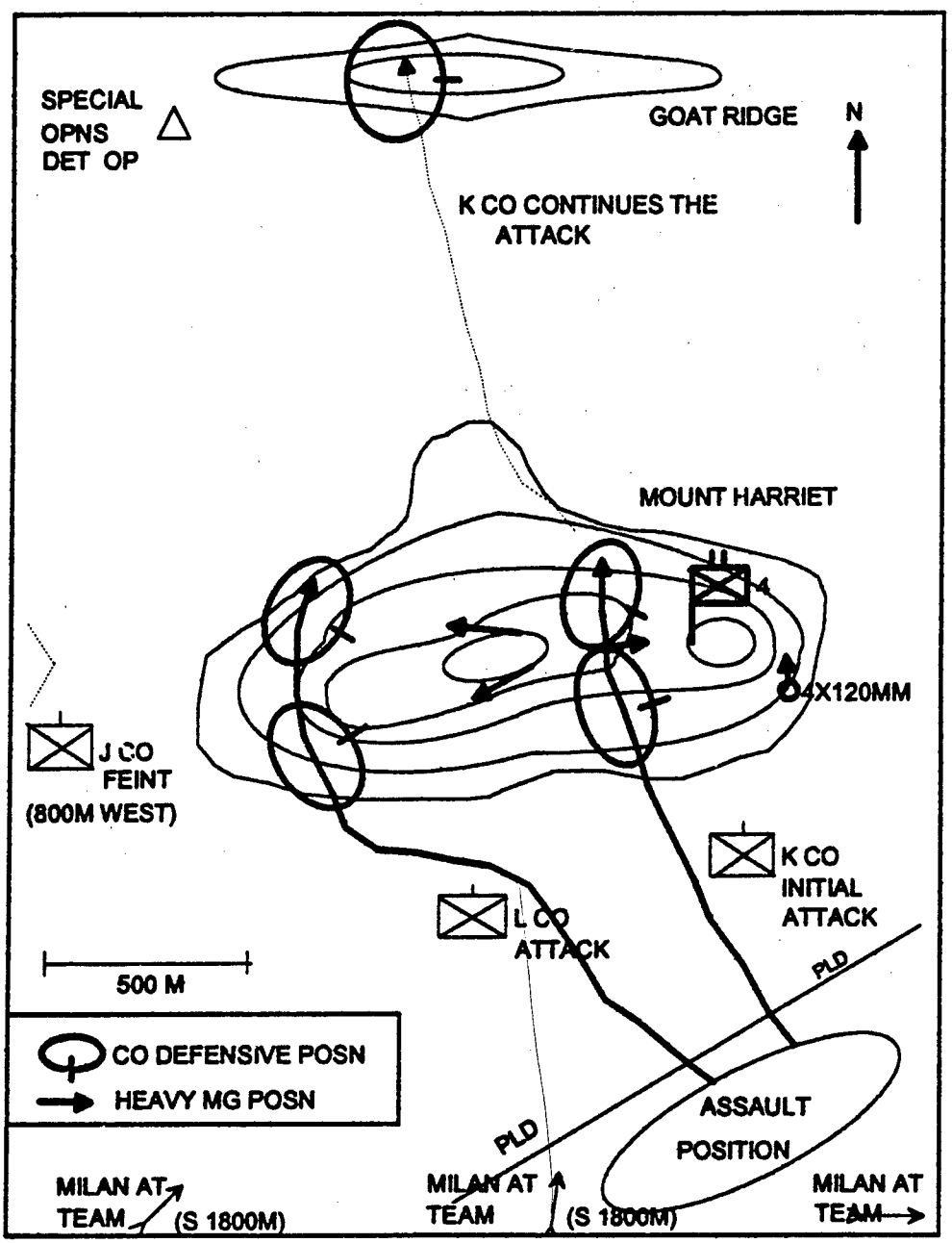

Figure 15

Order of Battle, The Whale Gap, 1992

Motorized Rifle Company, Opposing Force Regiment, Defending the Southeastern Flank of The Whale Gap

Headquarters Element	
Motorized Rifle Platoon	Approximately ten soldiers were
Motorized Rifle Platoon	assigned to each motorized and
Motorized Rifle Platoon	tank platoon
Tank Platoon	
Infantry Platoon	Approximately thirty soldiers
Reconnaissance Elements	Various mounted and dismounted reconnaissance and security elements operated to the company's front
Artillery Battalions	152mm artillery and 122mm rocket fires in general support of parent battalion
Commander	First Lieutenant Opposing Regiment

Light Infantry Battalion, Heavy Brigade Task Force, Attacking the Southeastern Flank of The Whale Gap

Headquarters Element	
A Company	Approximately 120 soldiers were
B Company	assigned to each company
C Company(-)	
Antitank Platoon	
Medium Mortar Platoon	
Scout Platoon	
Engineer Sapper Platoon	
Reserve Rifle Platoon	From C Company
Artillery Battalion	155mm howitzer battalion in direct support
Commander	Lieutenant Colonel, Infantry

Figure 16

Light Infantry Battalion's Plan Of Attack

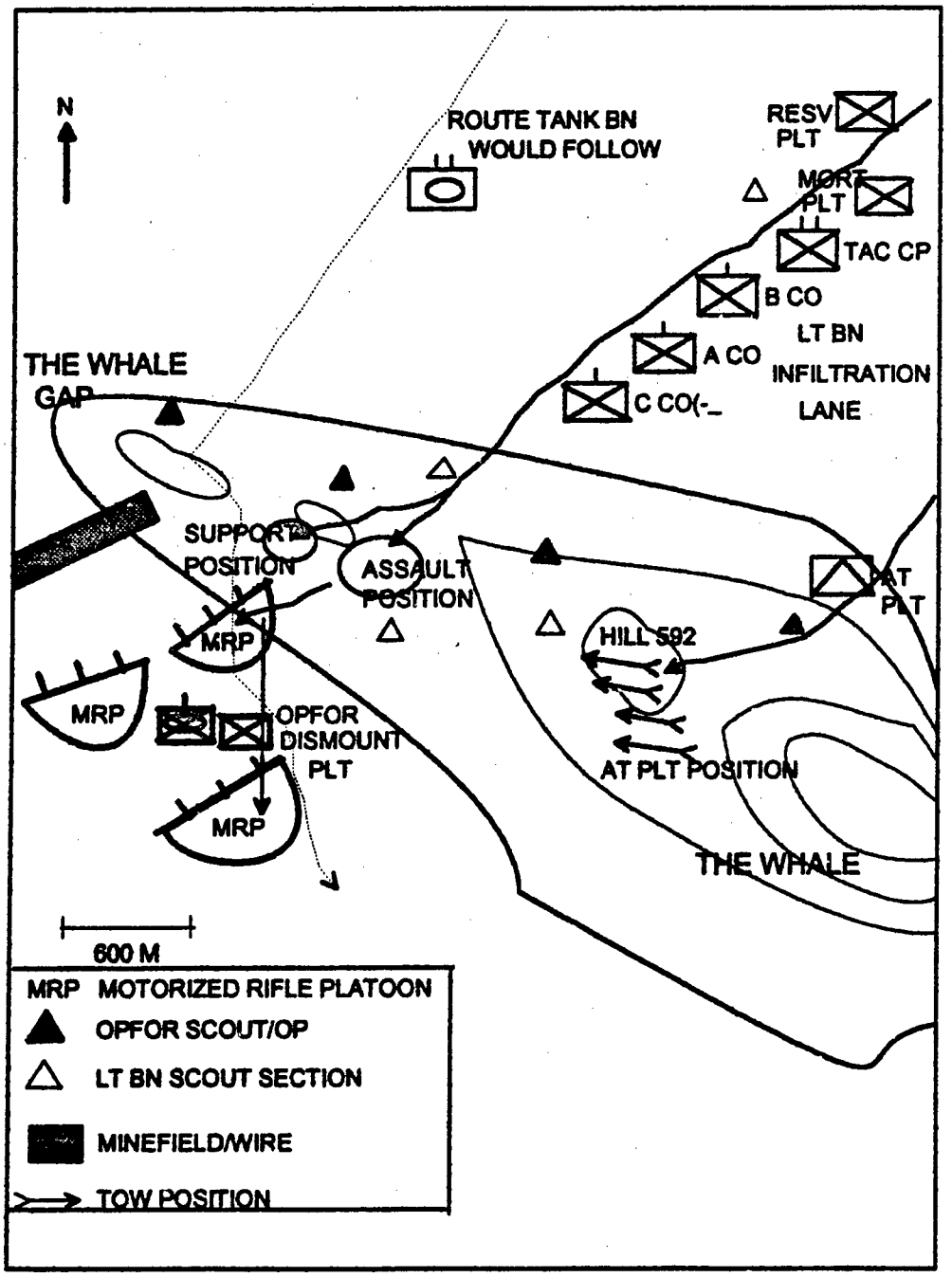

Figure 17

ENDNOTES

[1]US Army, FM 7-20, The Infantry Battalion (Washington: Department of the Army, 1992), 1-1.

[2]For a description of the linear attack that was the standard, and only night attack tactic until 1990 see, US Army, FM 7-10, The Infantry Rifle Company (Washington: Department of the Army, 1990), 4-39 to 4-43.

[3]The concept of using night vision devices to allow infantry units to conduct operations at night in much the same manner as daylight is a relatively new one. The current light infantry doctrinal publications first began to emphasize it in the field manuals that were released in 1990. Ibid., 4-36.

[4]Nautical twilight occurs when the Sun is nine degrees below the horizon. For a discussion of the specific parameters governing the military definition of daylight and darkness see, F.P. Henderson, "The Effect of Daylight and Darkness on Military Operations," Marine Corps Gazette 73 (July 1989): 28.

[5]The current doctrinal publications referred to include: US Army, FM 100-5, Operations (Washington: Department of the Army, 1986), FM 7-10, The Infantry Rifle Company (Washington: Department of the Army, 1990), FM 7-20, The Infantry Battalion (Washington: Department of the Army, 1992), and FM 90-22, Multi-Service Night and Adverse Weather Combat Operations (Washington: The TAC-TRADOC Air Land Forces Application Agency, 1991). For the purposes of this monograph the current doctrine for infantry brigade and division operations was considered to be obsolete because of the dated nature of the publications. See US Army, FM 7-30, Infantry, Airborne and Air Assault Brigade Operations (Washington: Department of the Army, 1981) and FM 71-100, Infantry, Airborne, and Air Assault Division Operations (Washington: Department of the Army, 1980).

[6]Chris Bellamy, The Future of Land Warfare (New York: St. Martin's Press, 1987), 296-7.

[7]FM 100-5, 98.

[8]Ibid., 127.

[9]Ibid., 127.

[10]Ibid., 127.

[11]This concept is alluded to, but not specified in FM 100-5. It is specified in, US Army, FM 100-5, Operations (Preliminary Draft) (Fort Monroe, VA: Headquarters, Training and Doctrine Command, August 1992), 4-7 to 4-8.

[12]US Army, FM 7-8, The Infantry Rifle Platoon and Squad (Washington: Department of the Army, 1992), 2-160 to 2-166, FM 7-10, 4-35 to 4-45, and FM 7-20, 3-11 to 3-14.

[13]FM 7-10, 4-22.

[14]Ibid., 4-36 to 4-37.

[15]Ibid., 4-37 to 4-39.

[16]Ibid., 4-39 to 4-40.

[17]Ibid., 4-39 to 4-40.

[18]Ibid., 4-40 to 4-42.

[19]Ibid., 4-43 and FM 7-20, 3-11 to 3-12.

[20]Stephen L. Canby (for C&L Associates), Classic Light Infantry and New Technology (Arlington, VA: Defense Advanced Project Agency, 1981), 47.

[21]Willard Latham, "On the Point," Infantry 67 (May-June 1977): 2-3.

[22]Jerry A White, "Commandan. ; Note--Owning the Night," Infantry 82 (May-June 1992): 1-2.

[23]Tamir Eshel, "Night Warfare," Defence Update International 87 (1988): 52, and Ernest Wood, "Through A Glass Darkly--Night Vision Equipment," Military Technology 12 (April 1988): 58.

[24]Eshel, "Night Warfare," 53, Wood, "Through a Glass Darkly--Night Vision Equipment," 58, and "Electronics for Night Fighting," Pacific Defence Reporter XV (May 1989): 56.

[25]Gorman C. Smith, "Division Night Attack Doctrine," MMAS Thesis (Fort Leavenworth, KS: US Army Command and General Staff College, 1964), 10, and "Electronics for Night Fighting," 56.

[26]"Electronics for Night Fighting," 56.

[27]The information on the night attack by a light infantry battalion is found in the National Training Center "Take Home Package for Heavy-light Rotation 92-12." US Army Training and Doctrine Command policy prohibits the use of personal or unit identification with information on the performance of individuals or units that take part in training at combat training centers. This take home package is available through the archives of the US Army Center for Lessons Learned, Fort Leavenworth, KS.

[28]Max Hastings and Simon Jenkins, The Battle for the Falklands (New York: W.W. Norton, 1983), 294.

[29]Ibid., 294.

[30]Nick Vaux, Take that Hill!, (Washington: Pergamon-Brassey's International Defense Publishers, 1986), 182.

[31]N.F. Vaux, "Commando Night Attack," Marine Corps Gazette 67 (October 1983): 42-43.

[32]Vaux, Take that Hill!, 189.

[33]Hastings and Jenkins, 177.

[34]Vaux, Take that Hill!, 157-167.

[35]Vaux, "Commando Night Attack," 43-44.

[36]UK Forces Falklands, Post Operational Report-OPERATION CORPORATE, (Aldershot, Great Britain: 3 Commando Brigade, 1982), E-6 and G-2 to G-3.

[37]Units are identified generically throughout this account. See note 27, above.

[38]The data on night attack success was compiled from Joint Readiness Training Center "Take Home Package Training After Action Report(s)" for Rotations 92-1A, 92-1C, 92-2A, 92-2B, 92-2C, 92-3, and 92-5. All are available through the US Army Center for Lessons Learned, Fort Leavenworth, KS. Unit failure was defined as not accomplishing the assigned mission within the constraints set in the Commander's Intent portion of the unit's operation order or fragmentary order.

[39]FM 7-10, 4-37.

[40]Ibid., 4-40.

[41]Ibid., 4-41.

[42]Ibid., 4-42.

[43]FM 90-2, 49 to 56, and US Army, FC 90-1, Night Operations (Fort Leavenworth, KS: Combined Arms Combat Development Activity, 1985), B-1 to B-35.

[44]Ibid.

[45]This data was extracted from various sections of US Army, Table of Organization and Equipment, Series 07 (Washington: Department of the Army, 1989). Some interpolation was required to match equipment to duty positions

[46]US Army, Weapons Systems, 1992 (Washington: Department of the Army, 1992), 173.

[47]FM 90-2, 65-70.

[48]Martin Windrow, ed., Battle for the Falklands (I), Land Forces (London: Osprey, 1982), 12 and 24.

[49]After Vaux, Take that Hill!, 172 and "Commando Night Attack," 42.

[50]After Vaux, "Commando Night Attack," 42.

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